
Theta LC301502

Laser Machine

User Pre-installation Guide

October, 2003

PRODUCTION
laser
Systems

Amada America, Inc.
7025 Firestone Blvd.
Buena Park, CA 90621
Tel. (714) 739-2111
Fax. (714) 228-0536
www.amada.com

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Warning

All work must be completed by qualified personnel.

Do not apply power to the machine until an Amada service engineer is present and has instructed you to do so.

Applying power to the machine without removing all wrapping paper and protective coatings may damage the machine.

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Pre-Installation Checklist

This form must be completed, signed, and faxed back to Amada's service department.

This is required before installation of your Amada laser can begin.

Each of the following items must be completed prior to scheduling a service engineer for installation.

Please contact the Laser Service Department if you have any questions in completing these steps.

East Coast office: Covington, GA	1-800-345-2374 Voice	1-770-787-0934 Fax
West Coast office: La Mirada, CA	1-800-334-2374 Voice	1-714-690-3248 Fax

- Uncrate the machine.
- Before placing the machine on the foundation, put all the jack bolts in place in the machine feet, and screw them down so that about 1" of the bolts extend below the bottom of the feet.
- Do not install the anchor bolts (required) until after A.E.S.I. completes the initial installation.

It is the purchaser's responsibility to install necessary safety devices.

Items to be Obtained:

- Distilled Water (Koolant Cooler: 75 gallons, CKD: 100 gallons, Orion: 50 gallons)
- Laser gas mix: two bottles. See page 9 for details.
- Assist gas: Oxygen, Nitrogen. See page 10 for details.

Placement of the Machine and Components:

- Plan the location of the machine, gas bottles, chiller, dust collector and any other accessory equipment. Take into account all the maintenance areas indicated on the floor plan.
- Prepare the machine foundation as required.
- The floor must be cleared of obstructions, clean and free of debris
- Each system component has been placed according to the Pre-install Guide
- Laser Gas bottle placed and secured from falling (25' of gas hose is supplied)
- Assist gases placed (50' of gas hose is supplied for nitrogen and oxygen) (see page 10)

Electrical Requirements

Electrical power has been connected to the top of the disconnects for each of the following:

- NC cabinet
- Laser power supply
- Dust collector
- Chiller

Preparation

- Chiller tank has been filled with distilled water only.
(on the CKD chiller, water hoses must be connected before filling tank)
- All plastic and paper coverings removed.
- Clean protective coating (cosmoline) from ball screws and LM guides.
- Each system component has been placed per the layout
- Shop air plumbed and connected to the machine. See page 7 for details.
- Shop air plumbed to dust collector with regulator. See page 7 for details.

I certify that each of the actions checked off above have been performed.

I understand that all of the above are needed for a successful installation and if any of the requirements are not met the installation will be delayed and I will be billed for one day's service at normal service charges, including expenses.

If the delay is to be more than one day the Engineer will be rescheduled to begin the installation on the first available Monday after the problem has been corrected and I will be billed for the additional travel expenses also.

Signature	Title	Date
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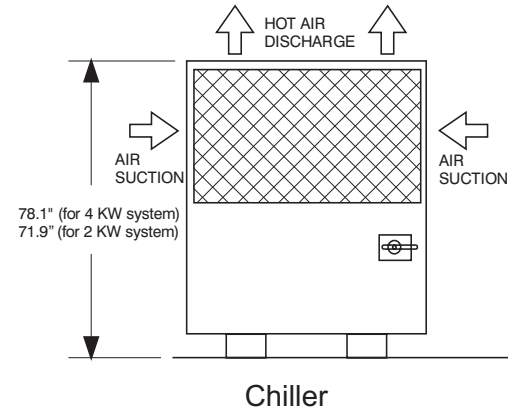
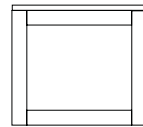
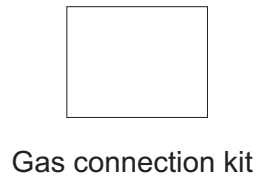
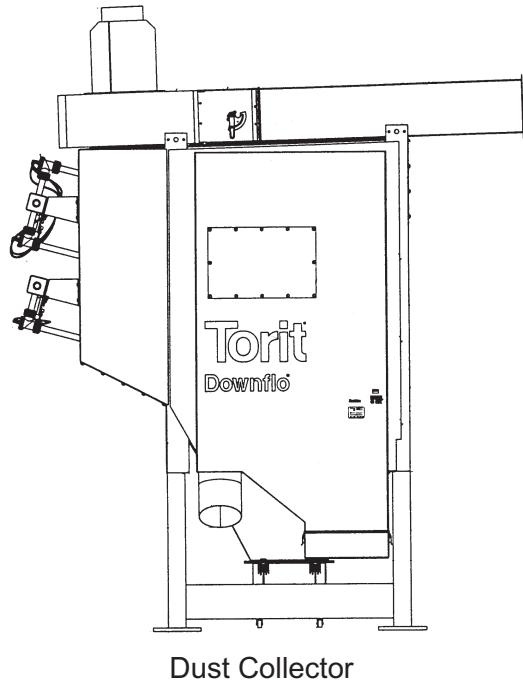
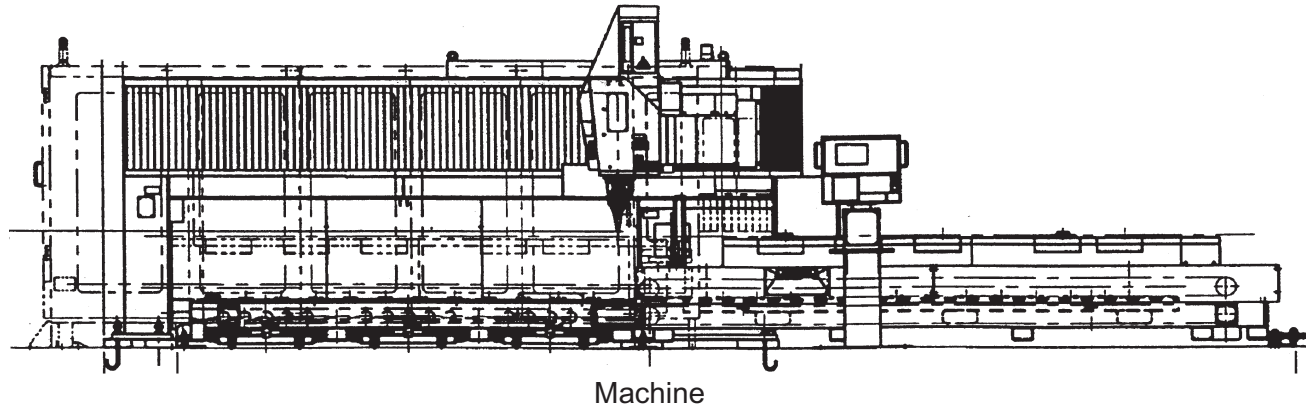
Description of the Major Components

Your laser systems will arrive in several crates. The machine and accessories are packaged in one crate. The chiller, dust collection system, gas regulators, and any optional equipment (such as transformers or safety mats) will be crated individually.

The major components are:

- ❑ The **machine** - includes laser oscillator. Note that several parts including the laser cutting head, lenses and nozzles may be inside the accessory crate rather than mounted in place.
- ❑ The **chiller** - this controls the running temperature of the laser oscillator. Flexible hoses and fittings are provided to connect it to the oscillator. The chiller can be positioned anywhere within a reasonable distance from the machine. For exact distance limitations, see the chiller section (beginning page 15) or contact Amada.
- ❑ The **accessory crates** - these crates contain many small pieces of equipment required to install and operate the machine.
- ❑ The **dust collector** - provided to capture dust and particles generated by the cutting process.
- ❑ The **gas connection kit** - this kit contains regulators, hoses, and fittings to connect the laser and assist gas bottles to the machine.
- ❑ The **optional transformer 1** - all components except the dust collector operate on 200~220 VAC 3 phase. If your supply is 230V, 460V or other voltage, a step down transformer will be required.
- ❑ The **optional transformer 2** - the dust collector requires 460V, 3 phase. If you do not have 460V at sufficient current for the unit selected, a transformer will be required.
- ❑ The **Shuttle System** - (option) provides rapid transfer of pallet table in/out of the machine.

Major Components



Size and Weight of Major Components

Ensure that you discuss the following dimensions and weights with your selected rigger, before the delivery of the machine.

Item	Approximate Dimensions (Length x Width x Height)	Approximate Weights
3015 Machine	340 inches x 150 inches x 105 inches	12,056 lb. (5480 KG) (with laser)
Shuttle	included	included
Laser (all)	included in machine	included in machine
Chiller Orion RKL-15000 (for 4KW laser)	63" x 36" x 78"	1540 lb.
Dust collector - Torit DFT3-1B	93" x 72" x 141"	3000 lb.
Dust collector - Farr GS-12	141" x 42 x 135"	call
Optional transformer (for 4KW laser)	call Amada's Laser Group	call Amada's Laser Group

* approximate or estimated value

Basic Specifications

FEATURE	SPECIFICATION	
NC unit	Fanuc 160iL (32 bit)	
Laser	Fanuc AF4000 4kW CO ₂ Fast Axial Flow	
Axis Travel	X	120 inches (3050mm)
	Y	60 inches (1530mm)
	X	19.6 inches (500mm)
	U	± 135° (Head Tilt)
	V	± 370° (Head Rotation)
	W	0.29 inches (7.5mm)
Maximum axis speed	X, Y	3150 inches per minute (80m/min)
	Z	2165 inches per minute (55m/min)
	U, V	250° per second
Maximum cutting thickness	see table on page 5	
Maximum worksheet weight	1540lbs. 700(kg) ¹	

¹ Depends on pallet/material handling system.

Laser and Production Cutting Specifications

FEATURE	SPECIFICATION
	Fanuc C4000AF
CW Power	4,000 Watts
Peak pulse power	5,000 Watts
Maximum material thicknesses: (maximum sheet size according to weight limitation)	
Carbon steel ² (O ₂)	0.5 inches (12 mm)
Stainless steel (N ₂)	0.375 inches (10 mm)
Aluminum (N ₂)	0.25 inches (6mm)

² Note that, especially in greater thicknesses, good results depend on good material quality

Supply Requirements

Electrical power supply

UNIT	RATING	SUPPLY
Machine (CNC)	200V~220 VAC 3 phase 60 Hz (15 Amp, 12 KVA)	200~220 VAC 3 phase**
Laser	Fanuc AF4000 4kW CO ₂ Fast Axial Flow: 200V~220 VAC 3 phase 60 Hz (160 Amp, 55 KVA)	200~220 VAC 3 phase**
Chiller	Orion RKL-15000: 200 VAC 3 phase ±10% 60 Hz (97 Amp, 36 KVA)	200~220 VAC 3 phase**
Total @ 200-220	125 KVA	200~220 VAC 3 phase**
Beam purge unit	Orion QSP180-11CA : 115V 1ph ±10% 50/60 Hz (23W)	
Dust collector³	Torit DFT3-18: 460 VAC* 3 phase ±10% 60 Hz (18 KVA) 15 hp	
	Farr GS-12: 460 VAC* 3 phase ±10% 60 Hz (20 KVA)	
* Units at other than 208 V not included in transformer sizing.		
** This is a min-max specification: no additional ± applies.		

³ Contact Amada to determine which dust collector is provided.

Other Requirements

Air supply

ITEM	Pressure/Volume	ISO8573.1 standard
Machine	80 psi at 9 ft ³ /min ⁴	Class 3-4-3
As cutting gas	140 psi at 35 ft ³ /min ⁵	Class 3-4-3
Dust collector - Torit DFT3-18	9 scfm at 90-100 psi	Class 4-5-5
Dust collector - Farr GS-12	12 scfm at 90 psi	
Laser Oscillator Gas	see laser pre-mix gas specification (p. 9)	n/a
Assist gases	see assist gas recommendations (p. 10)	n/a

Coolant

Chiller coolant includes the following:

Distilled water	(Koolant Kooler: 75 gallons, CKD: 100 gallons, Orion: 50 gallons)
Additive (provided with machine) ⁶	1 gallon provided (mix 1:100 additive:water)

Connections

Hoses to connect air supplies to machine and dust collector

Laser pre-mixed gas (see page 9)

Assist gas (oxygen minimum) (see page 10)

⁴ 2 micron maximum particulate size

⁵ Pressure and flow based on process requirements (material type and thickness) - contact Amada to discuss.

⁶ ISOGUARD Corrosion inhibitor, part# 71679859. Additional quantities available from AESI, at (714) 670-2111

Air specifications - ISO 8573.1 standard

The standard provides a uniform way to specify air quality in terms of particle size, pressure dewpoint, and oil content.

Class 2-4-3 means class 2 particulate, class 4 dewpoint, and class 3 oil content.

(1 micron particulate, 37 °F dewpoint, 1 mg/m³ oil content) (maximums)

The following table lists the maximum contaminations in each category.

Quality Class	Particle size in microns	Pressure dewpoint	Oil content
1	0.1	-70 °c (-57°F)	0.01 mg/m ³
2	1	-40 °c (-40°F)	0.1 mg/m ³
3	5	-20 °c (-4°F)	1 mg/m ³
4	15	+3 °c (37°F)	5 mg/m ³
5	40	+7 °c (45°F)	25 mg/m ³

Connections

The customer must provide:

Hose, regulator, and fittings for the dust collector.

Hose and fittings for the machine.

Laser pre-mixed gas (see page 9)

Assist gas (oxygen minimum) (see page 10)

Laser Pre-mix Gas

Laser gas quality is critical to the performance and reliability of the laser. Based on our experience, we recommend BOC's LASERSHIELD F or AGA's LaserMix 21.

Call either of these national 800 numbers to locate the supplier closest to you.

AGA Gas Inc. 1-800-837-7226

BOC GASES 1-800- 742-4726 [HTTP://www.boc.com](http://www.boc.com)

A two stage regulator and twenty-five feet of hose with 3/8" fittings is provided to connect the gas bottle to the laser. If the installation requires a longer length, use Teflon/polyethylene hose only.

IMPORTANT - The installation of your machine can not be completed without the correct laser gas. Be sure to obtain at least two bottles prior to scheduling installation. The typical gas bottle will hold 220 ft³ of usable gas. For the 2000W laser, a single bottle of gas should last one to two months on a single shift basis. However, during installation, more gas is used than in normal operation.

Laser Pre-mix Gas Specification

Laser gas quality is critical to the performance and reliability of the laser. Based on our experience, we recommend AGA's LaserMix 21 or BOC's LASERSHIELD F. If you choose a supplier other than AGA or BOC, use the following laser gas specification.

NOTE: If the gas is not mixed to the required specifications, the laser will not run correctly. The laser uses a mix of carbon dioxide (CO₂), Nitrogen (N₂) and Helium (He) at 28 psi. Give this specification to your gas supplier.

Laser Oscillator Gas Mixture

Gas	CO ₂	N ₂	He
Pre-mix ratios	5% ±0.25%	55% ±2.75%	40% ±2.0%
	4.75% - 5.25%	52.25% - 57.75%	38% - 42%
Purity		99.99%	
Moisture		5 ppm total maximum	
Hydrocarbon C _n H _m		1 ppm total maximum	

We recommend that you purchase gas that is certified to meet the specifications provided.⁷

⁷ This means that any impurities from the bottle are included in the certified purity.

Assist Gas Recommendations

The machine has provision for three kinds of assist gases. The assist gas inputs are at the rear of the machine. The inputs are labeled OXYGEN, CLEAN CUT, and AIR.

Oxygen is normally used to cut steel and stainless steel.

Nitrogen is used to Clean Cut™ stainless steel and aluminum with an oxide free edge.

Shop air can be used to cut aluminum at reduced cost (see page 26).

Two-stage regulators and hoses are provided in the gas connection kit for the oxygen and the nitrogen. For high-volume/frequent use, cutting gases should be purchased in liquid form. Note that the liquid gases will “boil-off” at some minimum rate, even if not used. Gases which are used in low volume or infrequently should be bought in high-pressure bottles rather than in liquid form.

An evaporator will be needed when using liquid high-pressure Nitrogen.

For usage and pressure requirements, contact Amada America’s Laser Group.

Gas Assignment	Inlet Port
Oxygen	OXYGEN
Nitrogen	CLEAN CUT
Shop air	AIR

Oxygen Purity

When cutting carbon steel with oxygen, higher purity means higher speed.

“Increasing the oxygen purity from 99.7% to 99.9% resulted in a cutting speed increase in excess of 10%.” according to the BOC article referenced below.

For a great discussion on assist gas purity, see [BOC article - gases and lasers](#) J T Gabzdyl & D Sullivan - Presented to Lumonics User Group, Minneapolis USA, May 1996

Machine Dimensions - LC3015 Theta Front View

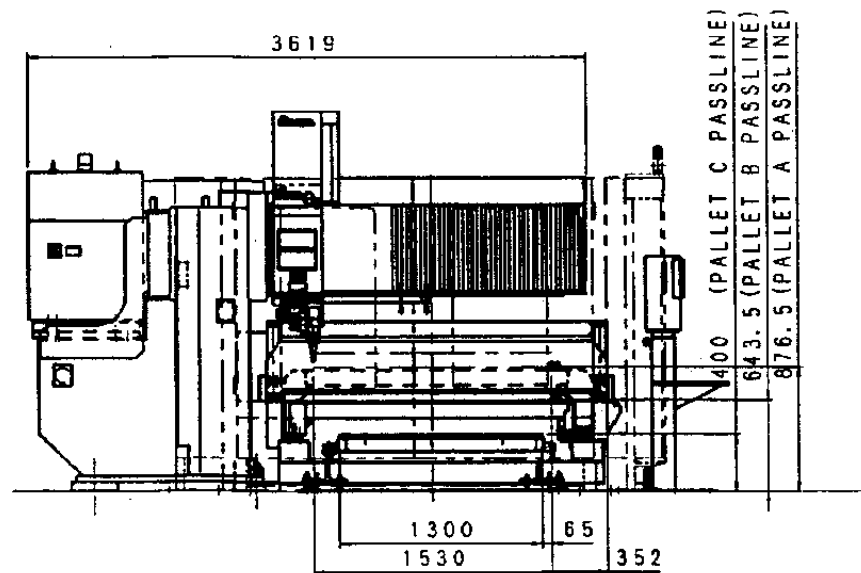


Figure 1: Machine from shuttle end

Machine Dimensions - LC3015 Theta Side View

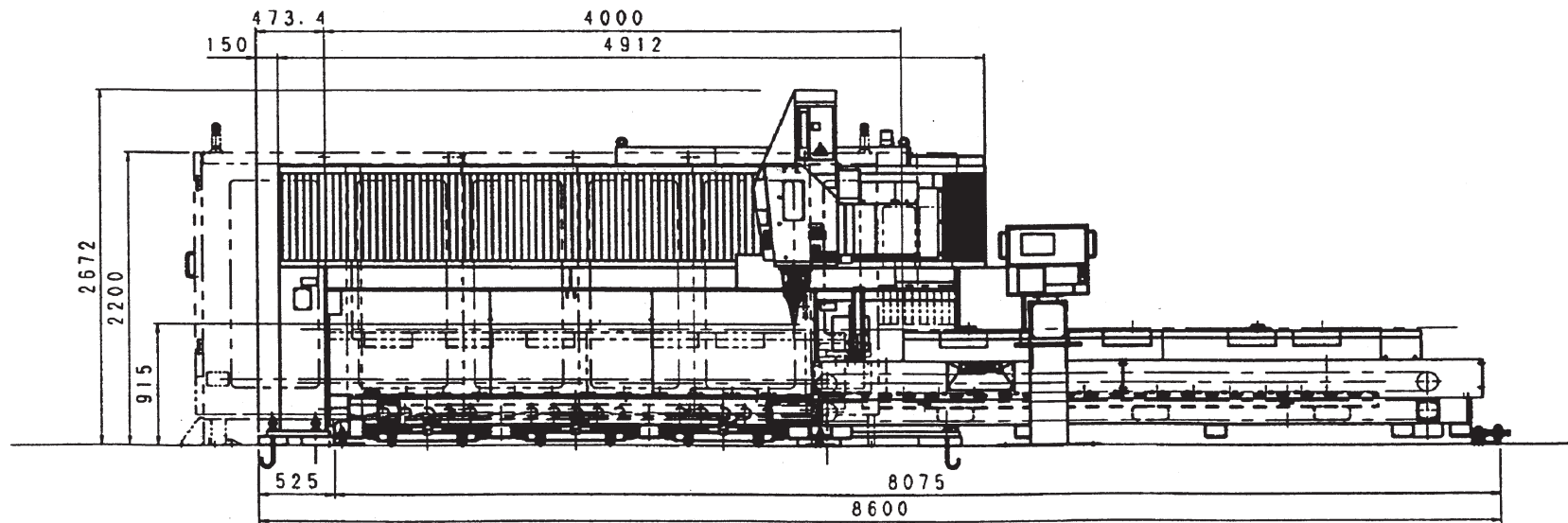


Figure 2: Machine from operator side

Machine Dimensions - LC3015 Theta Plan View

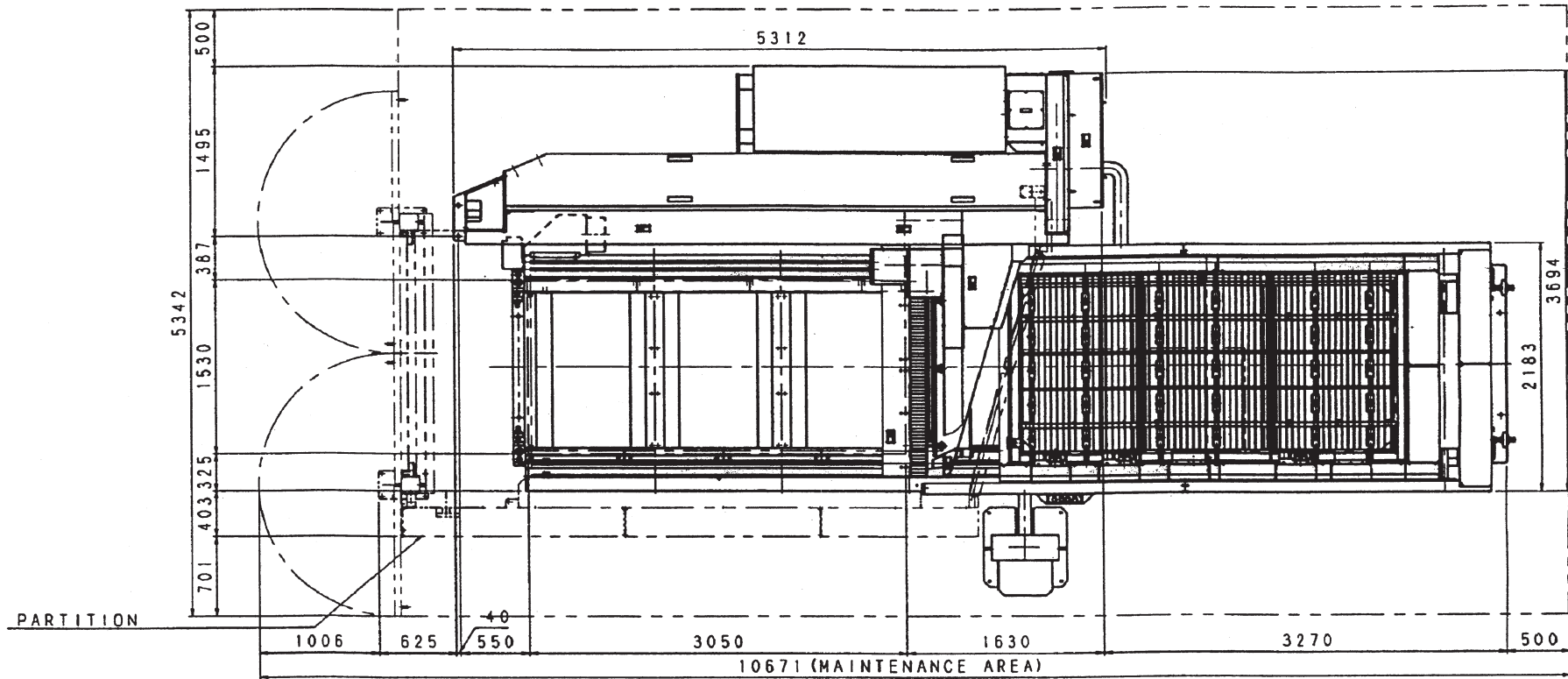


Figure 3: Machine from top

Planning The Location of the Machine

The diagrams following provide the details for positioning your new machine.

- ❑ No obstacles are allowed in the table travel area, and the machine must be at least 3 feet from any wall or obstruction, and the ceiling must be at least 40" above the top of the machine.
- ❑ The machine must be placed on a single continuous foundation (see Machine Foundations section).
- ❑ In addition to the maintenance areas recommended, ensure that
 - (1) the doors of the NC and Laser cabinets are unobstructed,
 - (2) the chiller airflow is unobstructed, and
 - (3) the NC unit is protected from direct sunlight.
- ❑ The positioning of the chiller and dust collector are flexible. Please see those sections for details.

The Chiller

The chiller is very important to the reliable operation of your laser cutting machine.

- ❑ The chiller must be placed so that an adequate flow of air is maintained.
- ❑ The positioning of the chiller is flexible. Two lengths of flexible hose and appropriate fittings are provided for connection to the system.
- ❑ If you plan to hard plumb the system, use only Brass, Stainless Steel, and/or Plastic. Black steel or Galvanized pipe and fittings are not permitted.
If the system is hard-plumbed, the total restriction of piping and fittings must not add up to more restriction than the standard flexible hose and fittings would have.
- ❑ The chiller is a closed loop system, but requires periodic addition of water and/or additives to replace evaporative losses.
- ❑ The chiller must be filled with proper coolant mixture. See page 7 for details.

DO NOT FILL THE CHILLER WITH CITY WATER, OTHERWISE SERIOUS AND EXPENSIVE DAMAGE MAY BE INFLICTED ON THE LASER OSCILLATOR

Chiller Dimensions

Orion Chiller

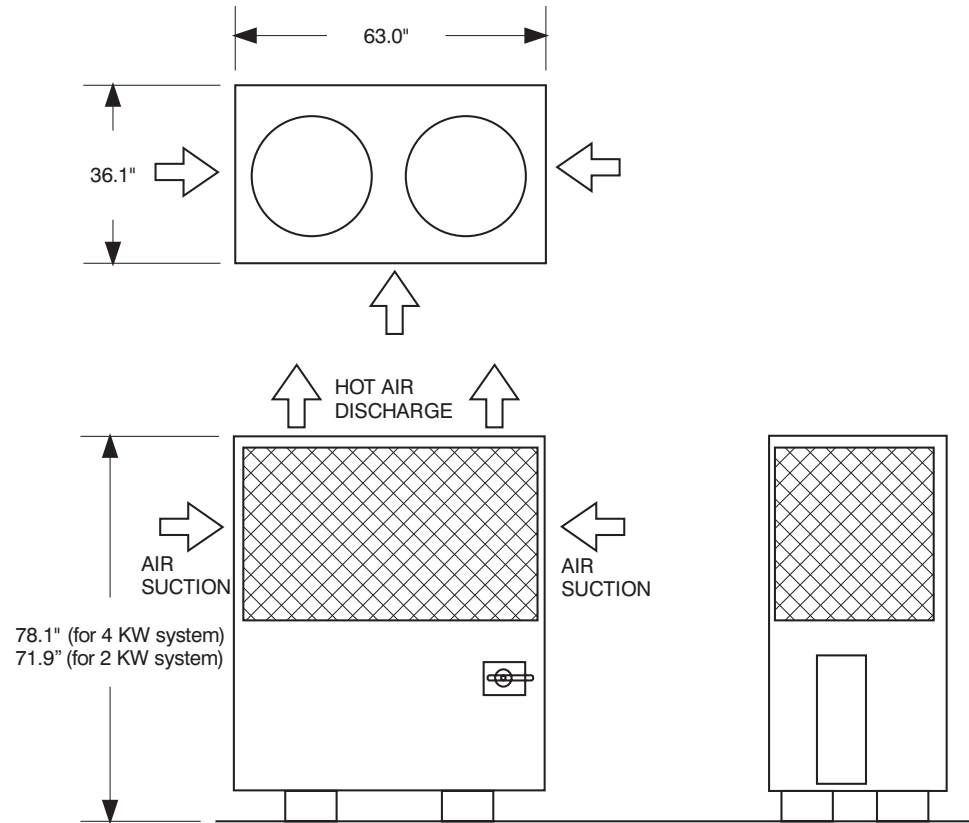


Figure 4: Orion RKL-15000

Dust Collectors

The dust collector is very important to the safe operation of your laser cutting machine. It will collect dust and particulate generated by the laser cutting process.

More than one dust collector type is available for the machine. Either unit, in standard configuration, is suitable for cutting most metallic materials. Neither one is suitable for cutting non-metallics for an extended period. Additional filters or alternate venting is generally required when cutting non-metallics.

- ❑ The positioning of the dust collector is flexible. The dust collector is connected with twenty feet of flexible hose and appropriate fittings.

Torit DFT3-18

Drawings of this unit are on this and the following page(s).

See page 7 for compressed air requirements.

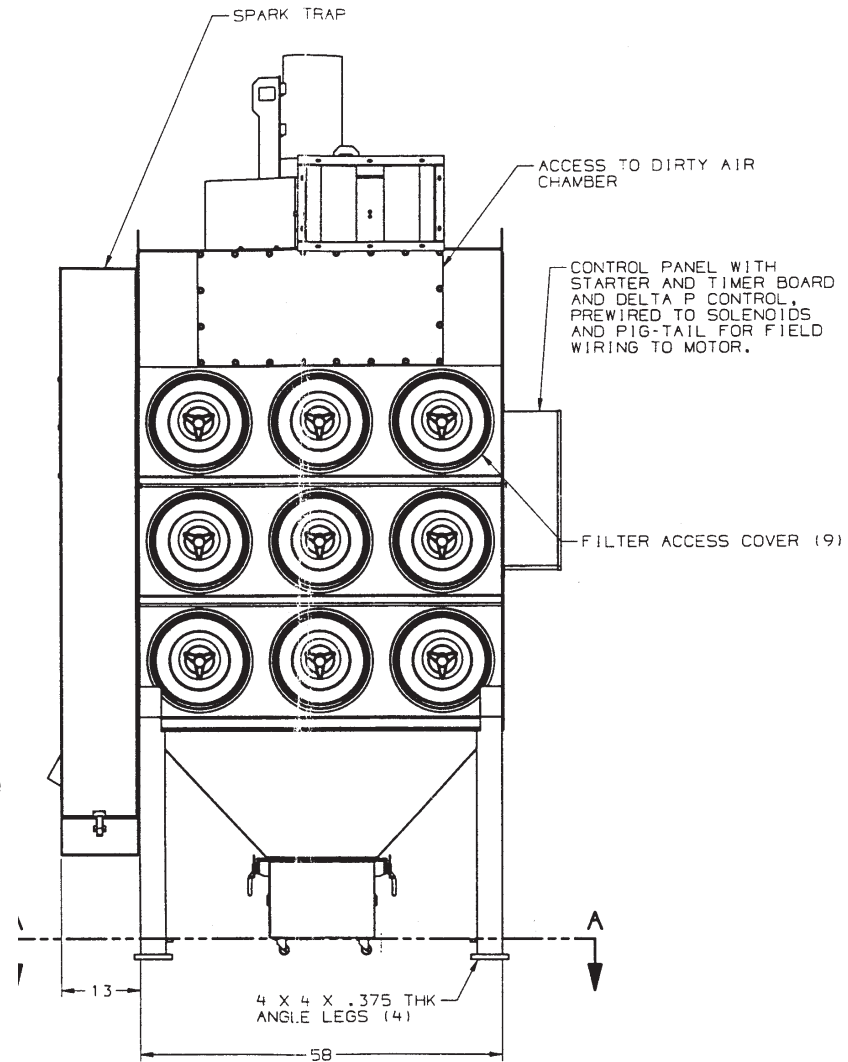


Figure 5: Torit DFT3-18, front side

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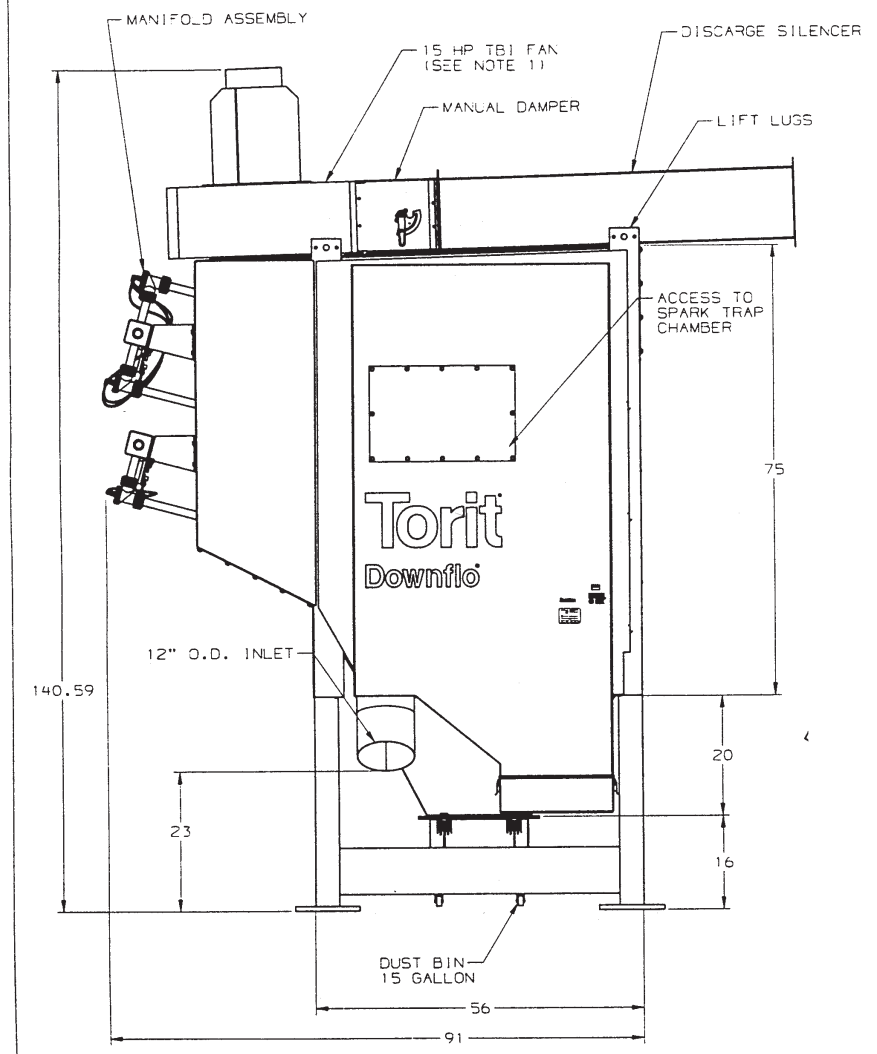


Figure 6: Torit DFT3-18, side view

Farr GS-12

See page 7 for compressed air requirements.

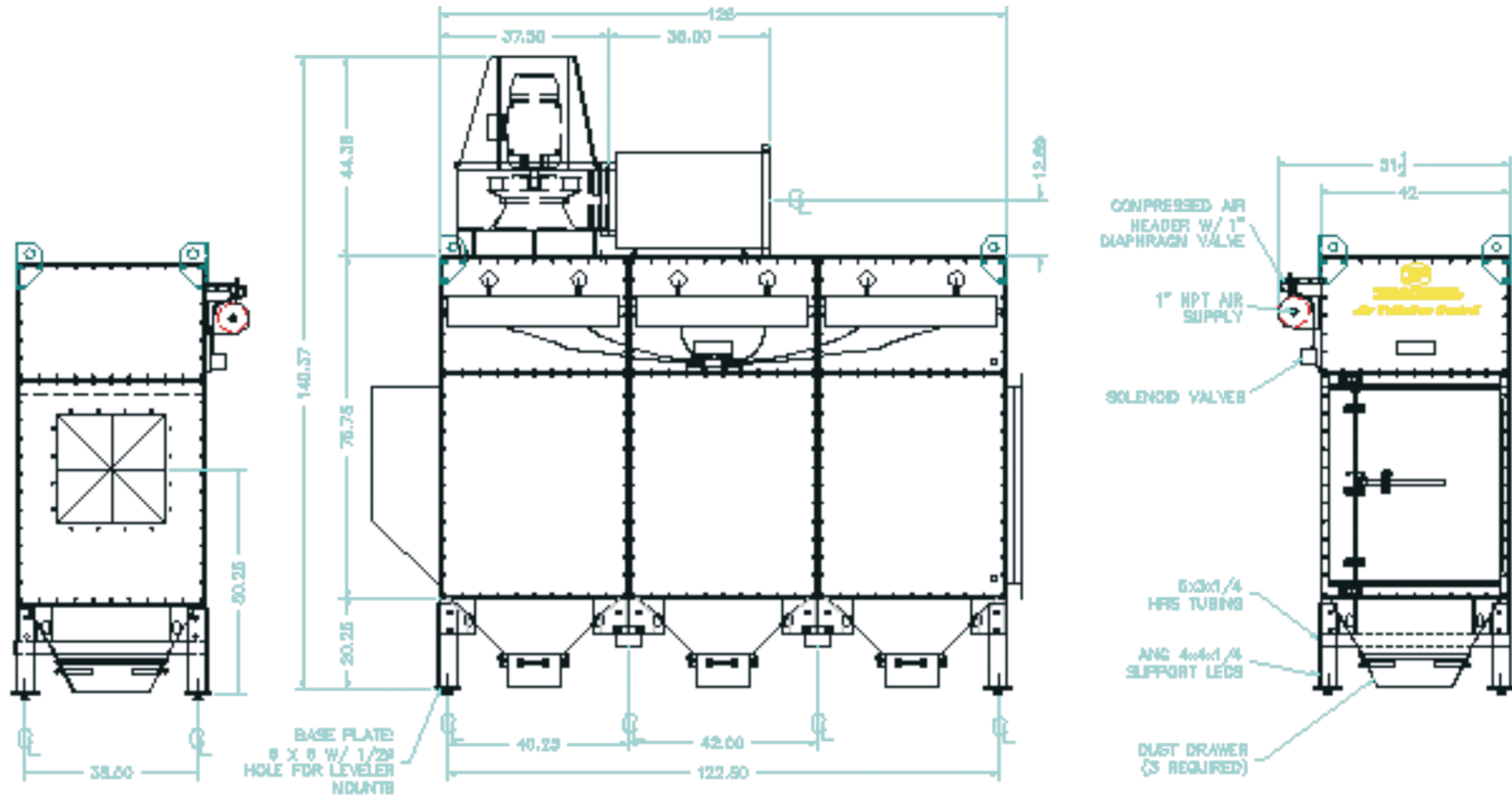


Figure 7: Farr GS-12

Machine Foundations

The machine must be properly secured to a suitable foundation. If an existing floor is used, it must be capable of supporting the weight of the machine. The load bearing and vibrational specifications are listed below.

Bearing capacity required		1124 lb/ft ²
Maximum external vibration / disturbance allowable	Max acceleration	0.05G
	Max amplitude	5 microns

It is the purchaser's responsibility to determine the necessary thickness of the foundation concrete to meet these requirements.

NOTE: The machine does not require any special foundation to produce accurate parts, but the laser and machine may not stay properly aligned if not properly supported and anchored. Improper support (floor cracking/motion) will result in more frequent service needs and reduced machine life.

A preferred foundation is given on the following pages.

Please note the following:

- The machine must be placed on a single continuous foundation. (This means no cracks or voids in the supporting slab)
- The base plates, anchor bolts, nuts and washers for the machine are provided in the accessory crate.
- Make sure that the machine will not be exposed to excessive external vibration. If the machine is located near a punch press, stamping press, large shear or other vibration source, it may be necessary to cut the foundation around the laser or provide additional isolation.
- Do not install the machine where it is exposed to direct sunlight or any other heat source.

Machine Foundations Cross Section

These drawings include pockets for the j-bolts (preferred method). If anchors are to be used instead, then the j-bolt pockets may be omitted when preparing the foundation.

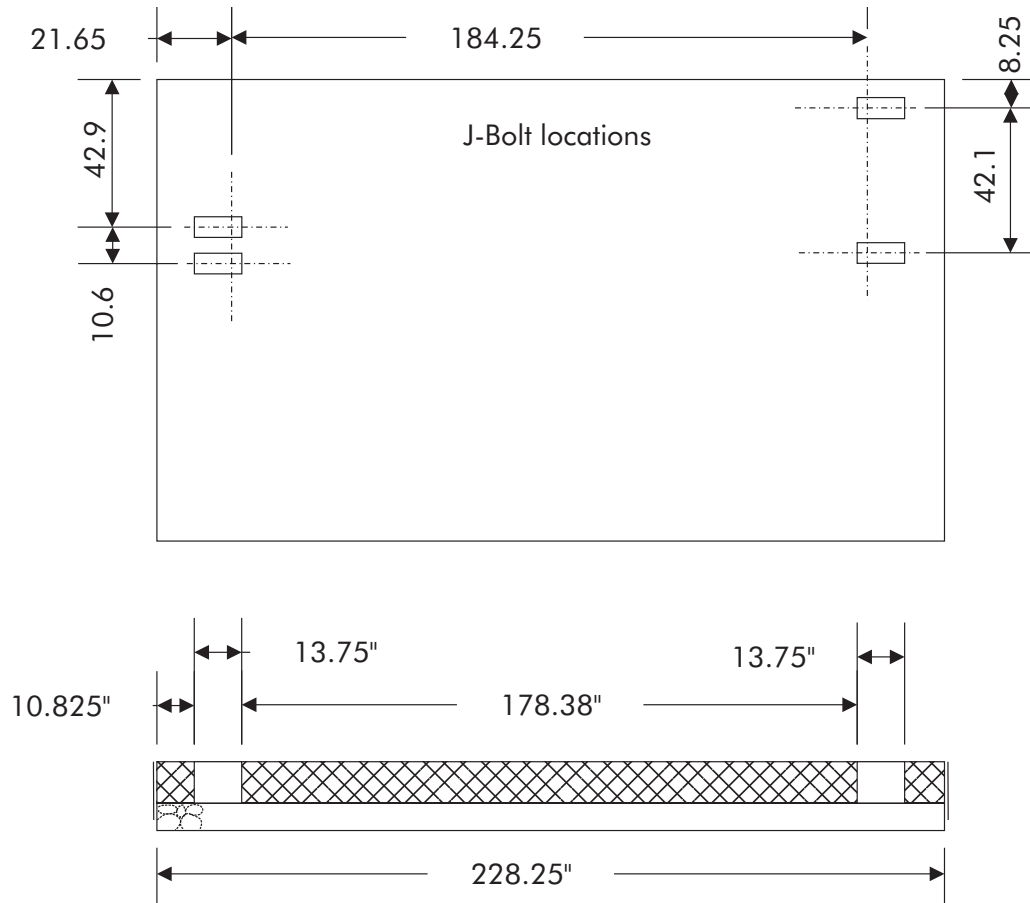


Figure 8: Foundation plan and side views

Foundation End View

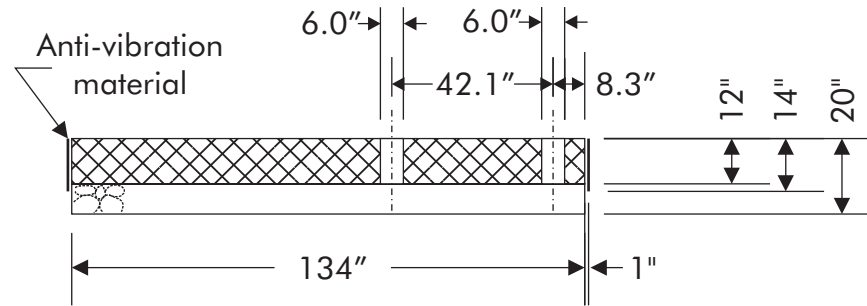


Figure 9: Foundation right end view

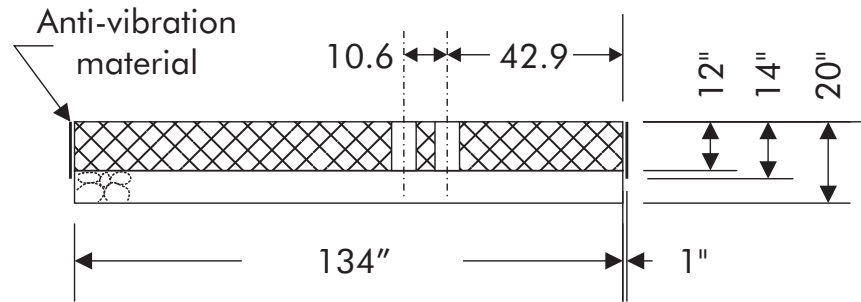


Figure 10: Foundation left end view

J- Bolt Detail

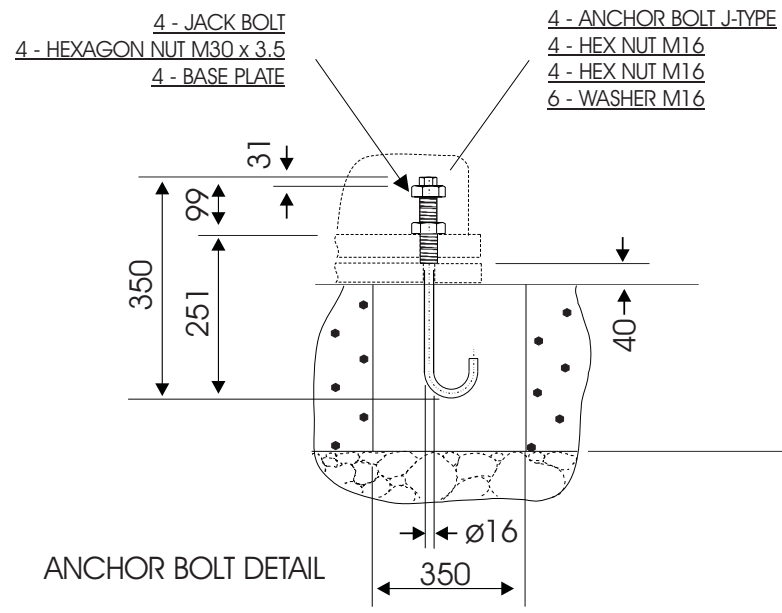


Figure 11: J- bolt detail

Lifting

Use the lifting eyes provided on the frame. See figure for permitted sling angles.

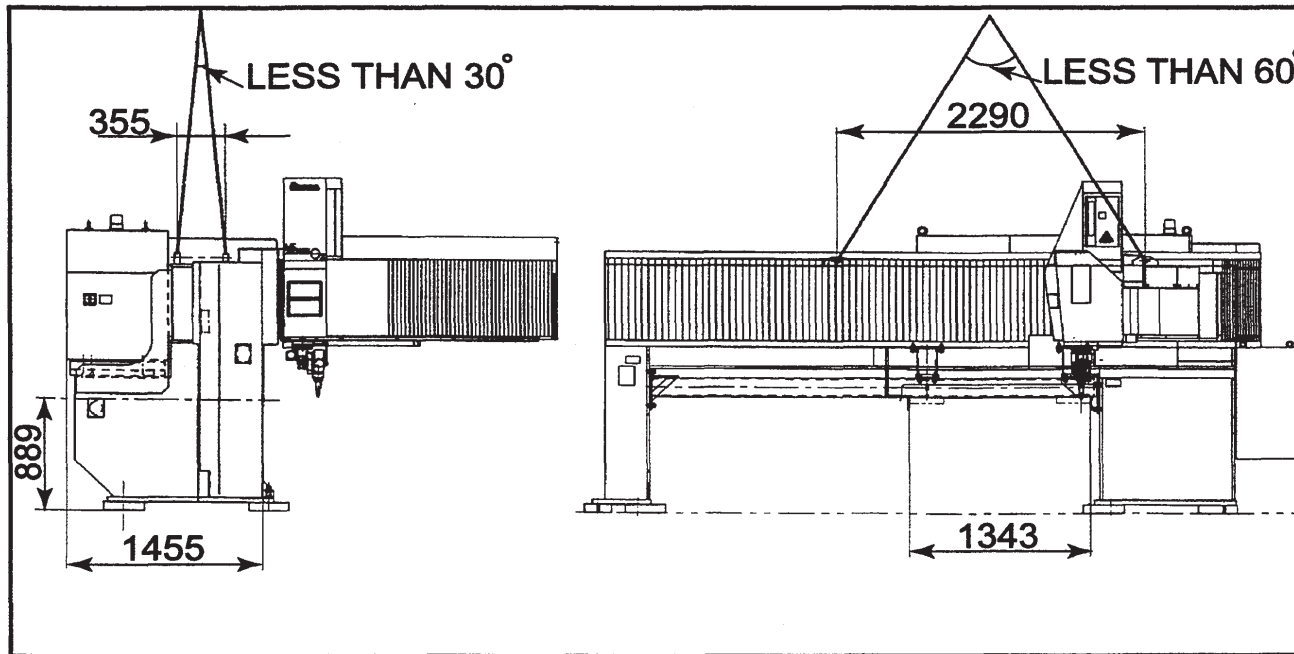


Figure 12: Lifting the Machine

Installing The Air Supply

The machine must be connected to a compressed air system by hose or pipe. The compressed air must be clean and dry. It may be necessary for you to purchase an air drier/filter. Please note the following:

- ❑ The air flow and pressure requirements are listed on page 7.
- ❑ The minimum inner pipe diameter for the machine is $\frac{1}{2}$ ".
The dust collector should have a separate $\frac{3}{4}$ " pipe, to provide isolation of the machine air supply from the pulsing of the dust collector.
- ❑ Clean dry shop air can be used as an assist gas for cutting some materials. To cut aluminum with air you must supply (at least) an additional 22.0 ft³/min. at 200 p.s.i.
- ❑ The air inlet is at floor level at the rear of the machine.
- ❑ The air must be dry at ambient temperature.

The air must meet the specifications on page 7.

Installing The Electrical Power Supply

The system requires four separate 3 phase power supplies. Power must be supplied to the CNC unit, the laser, the chiller and the dust collector. Power should be supplied from a line separate from those for welding machines and other processes that produce electrical noise. Ground rods must be installed next to the laser and CNC cabinets.

Laser and CNC grounding	
cable gauge	at least same as power leads
grounding resistance	less than 10 ohms

A sample wiring layout is shown on the following pages.

Wiring entry and connect points are shown on pages 29.

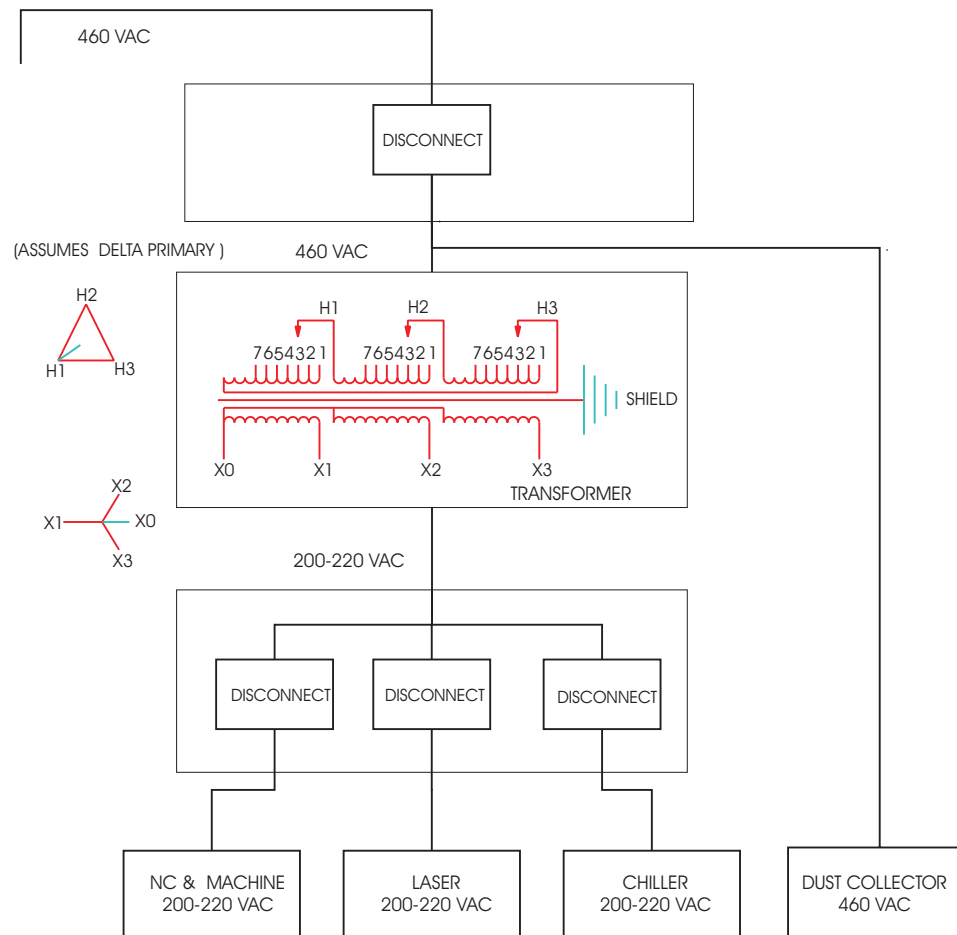


Figure 13: Electrical connect 460 VAC

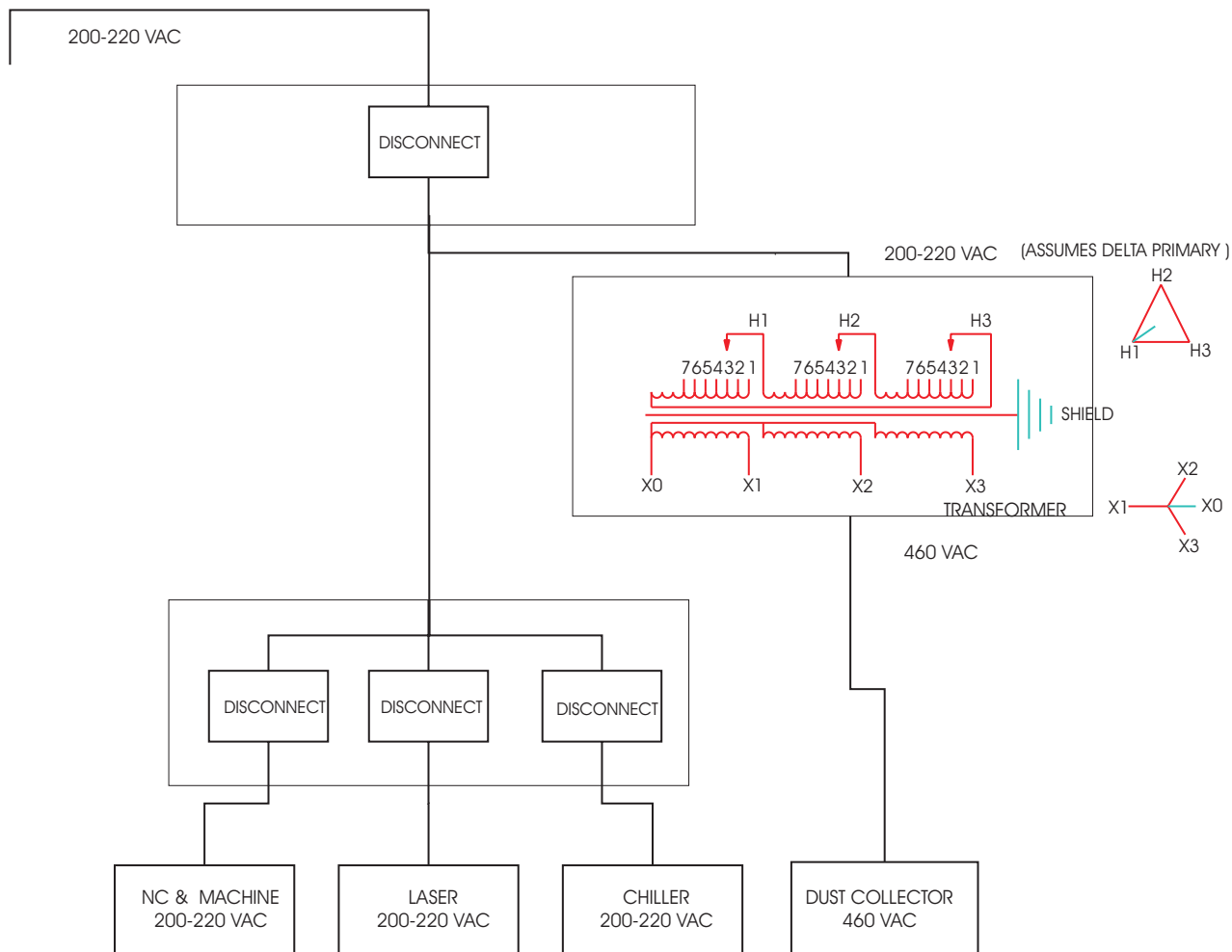


Figure 14: Electrical connect 230 VAC

Notes

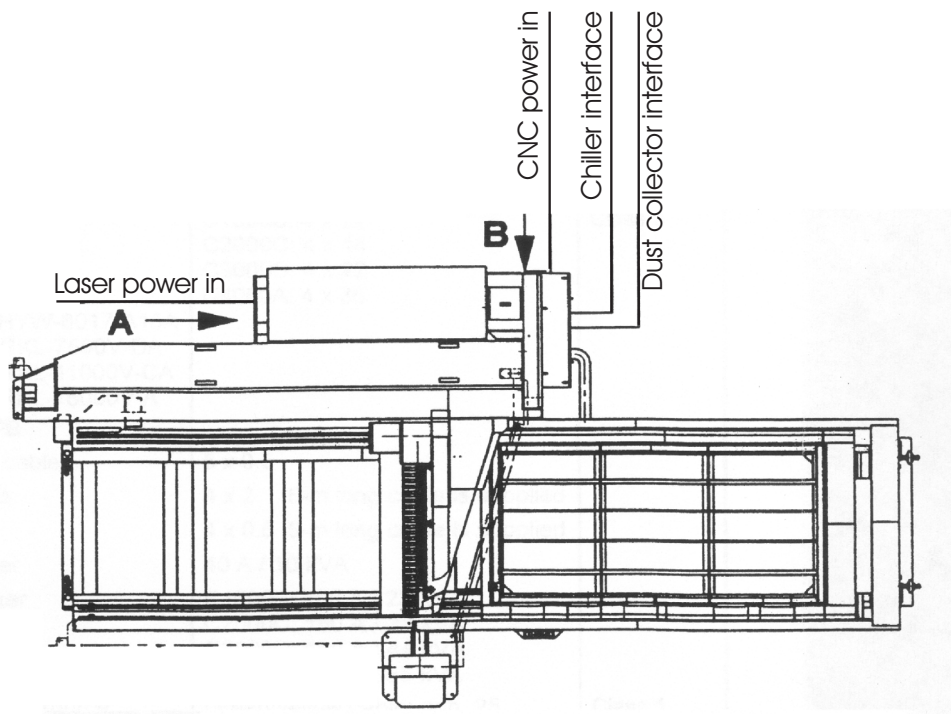


Figure 15: Entry point for cables

CNC power connect, Figure 16
 A: Power cable
 B: Breaker

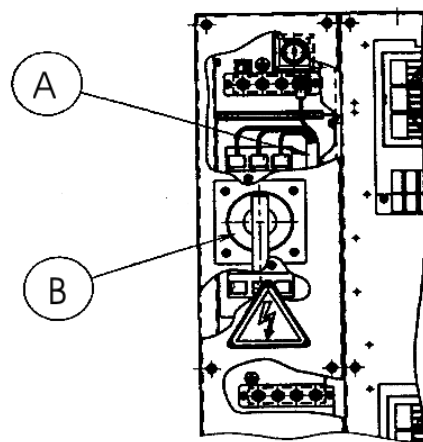


Figure 16: NC & machine power connect

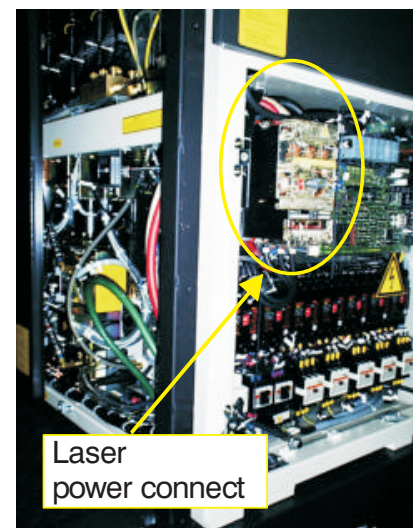


Figure 17: Laser power connect

Protective Coatings

The machine may have protective coatings, possibly including wrapping paper and/or cosmoline or other grease.

When present, the wrapping paper must be removed before moving the machine axes. Protective grease or cosmoline must be thoroughly cleaned off before running the machine.

- ❑ Check the X-axis, Y-axis, and Z-axis LM guides for wrapping paper and protective coating. Make sure that you remove any paper from both sides of the carriage.
- ❑ Check Z-axis guides and ballscrew and clean up as needed.
- ❑ A suitable solvent such as kerosene may be used to remove the protective coating.

Revision history

Version	Details
Initial (May 2001)	Initial version
	Revised dwg p. 22 . Asstd formatting, editing revisions.
Oct 01	Revised foundation drawings
Jan 03	Electrical supply p. 6. Formatting, editing revisions
October, 2003	Electrical supply- correct kVa and amperage for CNC

Contact Information

Company/group	purpose	Phone
Amada America Inc., Laser group	Questions regarding machine configuration, equipment, operation	714 739-2111 800 626-6612 - US 800 634-7952 - Calif. only
Amada America Inc., School /Publications	Questions / comments regarding this document.	As above
Amada Service	Requests for service and service-related issues.	800 334-2374 Pacific region 800 345-2374 Atlantic region